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Physical restraining of nursing home residents in the last week of life: An epidemiological study in six European countries

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ABSTRACT

Background: End-of-life care in nursing homes holds several risk factors for the use of physical restraints on residents, a practice shown to be neither safe nor effective.
Objectives: To determine the frequency of physical limb and/or trunk restraint use in the last week of life of nursing home residents in six European countries and its association with country, resident and nursing home characteristics.
Design: Epidemiological survey study.
Setting: Proportionally stratified random sample of nursing homes in Belgium (BE), England (ENG), Finland (FI), Italy (IT), the Netherlands (NL), and Poland (PL).
Participants: Nursing home staff (nurses or care assistants).
Methods: In all participating nursing homes, we identified all residents who died during the three months prior to measurements. The staff member most involved in each resident's care indicated in a structured questionnaire whether trunk and/or limb restraints were used on that resident during the last week of life 'daily', 'less frequently than daily' or 'not used'.
Results: In 322 nursing homes, staff returned questionnaires regarding 1384 deceased residents (response rate 81%). Limb and/or trunk restraints were used "daily" in the last week of life in 8% (BE), 1% (ENG), 4% (FI), 12% (IT), 0% (NL), and 0.4% (PL) of residents; and "less frequently than daily" in 4% (BE), 0% (ENG), 0.4% (FI), 6% (IT), 0% (NL), and 3.5% (PL) of residents. Restraint use was associated with country ($p = 0.020$) and inversely associated with residents' age ($p = 0.017$; odds ratio 0.96, 95% confidence interval 0.93 to 0.99). Restraint use was not significantly associated with resident's gender, dementia, functional status, staffing level, or the level of dependency of residents within the nursing home.
Conclusions: In all but one of the six countries studied, staff reported that nursing home residents were restrained through limb and/or trunk restraints in the last week of life. The proportion of restrained residents was highest in Italy and Belgium. Organizational and resident characteristics may not be relevant

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predictors of restraint use at the end of life in this setting. National policy that explicitly discourages physical restraints in nursing home care and suggests alternative practices may be an important component of strategies to prevent their use.

What is already known about the topic?

- End-of-life care in nursing homes carries several risk factors for the use of physical restraints, such as limb or trunk restraints, including among residents who are dying
- Physical restraints were shown to be neither safe nor effective; they do not reduce the risk of falls or injury and can have negative physical, psychological and social consequences for residents and family.
- National policy in many European countries discourages the use of physical restraints in health care, yet there are no epidemiological data on the use of this measure at the end of life of nursing home residents, which hinders monitoring and policy-making.

What this paper adds

- This six-country epidemiological study of 1384 deaths of nursing home residents found that a concerning proportion had limb or trunk restraints in the last week of life, especially in Italy (18%) and Belgium (12%); this proportion was lower in Finland (4%), Poland (4%), England (1%), and the Netherlands (0%).
- There was no evidence of an association between restraint use and staffing levels per number of occupied beds or the level of dependency in the resident population within a nursing home.
- National policy that explicitly discourages physical restraints in nursing home care and suggests alternative practices may be an important component of strategies to reduce their use.

1. Introduction

In many high-income countries, one in three or more of deaths occur in nursing homes (Broad et al., 2013; Pivodic et al., 2016). This article uses the term 'nursing home' to refer to 'collective institutional settings where care, on-site provision of personal assistance in daily living, and on-site or off-site provision of nursing and medical care, is provided for older people who live there, 24 h a day, seven days a week, for an undefined period of time (Froggatt and Reitinger, 2013; Sanford et al., 2015).

The circumstances of end-of-life care in nursing homes may foster the use of physical restraints, including among those who are dying. Risk factors for restraint use are abundantly present in this population: dementia and physical and psychosocial distress, (Pivodic et al., 2018; Vandervoort et al., 2013) impaired mobility, increased dependency, high perceived fall risk, and repeated verbal and physical agitation (Hofmann and Hahn, 2014).

There are compelling arguments for reducing, if not eliminating, the use of physical restraints in nursing homes, and in particular among people who are in their last days of life. Physical restraints were shown to be neither safe nor effective. They do not reduce risk of falls or injury (Sze et al., 2012). They can have negative physical (e.g. decubitus, urinary and fecal incontinence, higher walking dependence, furthermore falls), psychological (e.g. anger, depression) and social consequences (e.g. social isolation) on residents and family (e.g. anger, worry) (Scheepmans et al., 2018). Restraint use considerably increases the risk and persistence of delirium, (Inouye et al., 2014) and can lead to death (Bellenger et al., 2018). Clinical trials and non-randomized experimental studies showed that physical restraints in nursing homes can almost completely be eliminated with reasonable levels of safety (Gulpers et al., 2012; Muñiz et al., 2016; Sze et al., 2012). However, to date no population-based data are available to monitor the practice of physically restraining residents at the end of life, compare its prevalence among countries, and guide policy-making towards lowering it.

We studied the use of physical limb or trunk restraints in the last week of life of nursing home residents in six EU countries (i.e. Belgium, England, Finland, Italy, the Netherlands, and Poland). The included countries represent different legal frameworks and policy contexts regarding the use of physical restraints in health care in general and nursing home care in particular. All allow exceptions to the general principle that no one shall be deprived of their liberty, under certain circumstances and in the context of health care. In Belgium, laws regulating nursing care and patient rights permit physicians and nurses to restrain patients with a view to preventing injury to patients or others (Van den Storme and Revier, 2017). However, the Flemish Ministry of Health states that physical restraints should be avoided (Agentschap Zorg and Gezondheid, 2017). In England, the Mental Capacity Act and the Deprivation of Liberty Safeguards state that restrictive interventions in health and nursing care are to be limited as much as possible and made in a person's best interest and proportionate to potential harm (Furniaux, 2018). The Department of Health has published a guidance with the aim to improve care by reducing restrictive interventions (Local Government and Care Partnership Directorate, 2014). In Finland, the use of physical restraints is regulated by the Mental Health Act and the Special Act on the Special Care for the Disabled. Guidelines of the Ministry of Social Affairs and Health and the National Advisory Board on Social Welfare and Health Care Ethics discourage the use of physical restraints in care for older people and suggest alternative practices. In Italy, the use of physical restraints in health care is not explicitly regulated by law (Di Lorenzo et al., 2012). However, jurisdiction reminds that many articles of the Penal and Criminal Code do apply to the subject matter mostly in the form of protection as the Italian constitution states that nobody can be subjected to disrespectful forms of treatments, unless in a state of necessity. Almost unanimously, relevant scientific societies in Italy discourage excessive use of restraints, especially physical ones. In the Netherlands, physical restraint use is indirectly addressed through the Act on the Special Admission to a Psychiatric Hospital and the Law on Medical Treatment Agreement. The latter can be applied to justify restraining a resident given certain conditions. These laws do not explicitly address physical restraints, but the country has issued several guidelines that strongly discourage the use of physical restraints and suggest alternative practices. For instance, the Dutch centre of Expertise for Long-term Care has introduced 85 alternatives to restraint use, (Kenniscentrum voor langudrende zorg, 2016). In Poland, mental health legislation allows health care professionals and social workers to restrain patients under certain circumstances (*Ustawa z dnia 19 sierpnia 1994 r. o ochronie zdrowia psychicznego*, 2014) Each

instance of restraint must be described in detail on a specific form, (*Rozporządzenie Ministra Zdrowia z dnia 21 grudnia 2018,* 2018) and accompanied by a regular (i.e. in 15-minute intervals) assessment of the restrained person's health and behavior. Nursing home residents must not be restrained for more than 8 h in total; longer periods are permitted only in hospitals (Kucmin et al., 2015).

This study aimed to determine the frequency of physical limb and/or trunk restraint use in the last week of life of nursing home residents in six European countries, and the extent to which this is associated with country and resident and nursing home characteristics.

2. Methods

2.1. Study design and setting

We conducted an epidemiological cross-sectional survey study of deceased residents of nation-wide representative samples of nursing homes in Belgium (Flanders), England, Finland, Italy, the Netherlands, and Poland. We identified all deaths of residents that occurred in and outside the nursing home over the period of three months prior to the moment at which researchers distributed questionnaires in the respective nursing home (data collection in 2015). To reduce the possibility of recall bias, staff were asked to report on deaths that occurred at most three months prior to the survey. This recollection period has been applied very often in mortality-follow back surveys in end-of-life care (Pivodic and Cohen, 2018; Vandervoort et al., 2013). To reduce potential non-response bias, we enclosed two types of information leaflets to the questionnaire: one providing information about the study and a letter in the name of the nursing home management explaining their participation in this study and reasons for it. We also ensured all participants that their responses will be anonymous and instructed them to return questionnaires directly to the research team rather than to other nursing home staff or management. Further details on the methods are provided in the published study protocol (Van den Block et al., 2016).

2.2. Sampling

We sampled nursing homes in each country through proportional stratified random sampling from national lists of nursing homes to obtain representative samples in terms of region within country, nursing home type, and bed capacity. In countries that have national lists of certified nursing homes (all except Italy), we used these lists to first stratify nursing homes by region (provinces or other large regions depending on the country) and subsequently by nursing home type and bed capacity (above and below the median number of beds in nursing homes in the country). We then randomly sampled nursing homes per stratum. Additionally, in England, we involved the Enabling Research in Care Homes Programme (ENRICH), a network of nursing homes with a stated interest in research, in highlighting the study to its members and advertized the study in nursing home magazines to improve the participation rate (Collingridge Moore et al., 2019; National Institute for Health Research, 2016). Of the 49 nursing homes recruited in England, 13 were identified through the ENRICH network and advertising. They did not differ significantly with regard to quality of care from the English nursing homes identified through random sampling (Collingridge Moore et al., 2019). In Italy, where no national lists of nursing homes are available, we sampled from a previously created cluster of nursing homes with interest in research participation (Onder et al., 2012). This convenience sample of nursing homes includes homes from 15 of 21 regions, covers the 3 macro regional areas (North, Center, and South) of Italy, and takes into consideration regional differences in terms of nursing home size (number of beds) and their characteristics (type, organizational status). A similar strategy was used in previous Italian nursing home studies including the EU SHELTER project (Onder et al., 2012).

The sample size calculation was conducted for the primary aim of the epidemiological study from which these data were taken, i.e. to compare the quality of dying and quality of end-of-life care in the six countries (Pivodic et al., 2018). Based on an expected minimum of 4 deaths per nursing home over three months, and taking into account non-response, 48 nursing homes needed to be recruited per country to achieve a sufficiently large sample of deaths for that analysis. Details of the sample size calculation have been published with the study protocol (Van den Block et al., 2016).

2.3. Participants and procedure

Questionnaires concerning the deceased resident's care were distributed to: 1) the nurse most involved in the care of the resident (henceforth termed 'staff member'); 2) the nursing home administrator/manager/head nurse (henceforth termed 'administrator'); and 3) the resident's treating physician (general practitioner [GP] or elderly care physician). The preference was for a nurse to complete the questionnaire; but if a care assistant was truly more involved in the care (according to the administrator) or if a nursing home only employed care assistants then questionnaires were distributed to them.

Assisted by a researcher, the administrator identified all deaths during the previous three months from administrative files and identified the relevant respondents per deceased resident using a structured checklist. The checklist was split in two parts, one containing names of residents and respondents, which stayed in the nursing home and was not accessible to researchers, and a second part containing unique anonymized identifiers. Together with the administrator, a researcher prepared the coded questionnaires. The questionnaires, together with the study information letters and a post-paid return envelope were then sent out by the administrator. Respondents returned the questionnaires directly to the research team using the provided return envelopes. In case of non-response, the administrators were asked to send up to two reminders (after three weeks each). The ethics committee in England allowed only one reminder.

2.4. Measurements

Staff members were asked the question 'were trunk or limb restraints used during the last week of life?' and given three response options: 1. 'used daily'; 2. 'used less frequently than daily'; 3. 'not used'. Staff reported the resident's functional status one month before death using the Bedford Alzheimer Nursing Severity-Scale (BANS-S)(Galindo-Garre et al., 2014). The resident was determined as having had dementia if *either* the treating physician or the staff member most involved in care indicated so and as not having dementia if *both* respondents indicated this, based on their clinical judgment. Nursing home administrators reported residents' age and gender, staffing levels of nurses and care assistants (full-time equivalent [FTE]), the number of occupied beds, and the number of residents per nursing home requiring full assistance in eating (indicator of the dependency of residents within the nursing home).

2.5. Analysis

We tested sample differences between countries using generalized linear mixed models (GLMM) with random intercept for nursing home (no random effects for comparisons of nursing home characteristics). We described the proportion of residents

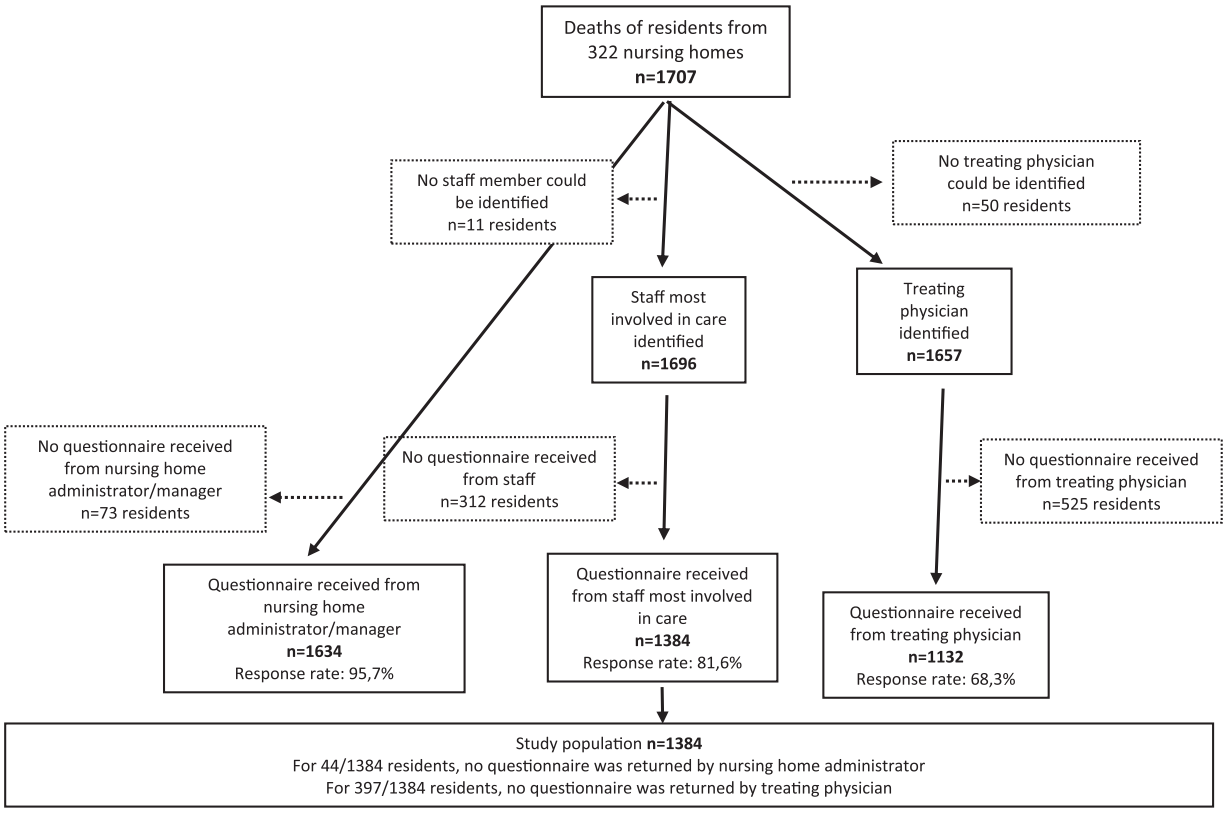

Fig. 1. Distributed and returned questionnaires regarding the nursing home resident in six countries.

restrained per country and the proportion of nursing homes per country in which at least one resident was restrained. To test whether restraint use is associated with country, resident- and nursing home characteristics, we calculated a GLMM with restraint use as dependent variable ('daily' and 'less frequently than daily' combined), random intercept for nursing home, and the following fixed factors: country; resident's age and gender; residents' functional status; presence of dementia; staffing level (FTE) by number of occupied beds, and residents' dependency relative to staffing levels. We checked all multivariable models for collinearity using variance inflation factors. Cases with missing data were excluded list-wise from analyses. Statistical significance was set at $\alpha<0.05$ (2-sided). All analyses were conducted in SPSS 25.

2.6. Ethics

We obtained ethics approval from the relevant ethics committees in each participating country or waivers for the collection of data of deceased residents (Netherlands, Italy). All respondents participated on a voluntary basis and remained anonymous. The return of a questionnaire was taken as consent to participate.

3. Results

We identified 1707 deceased residents in 322 nursing homes. A staff member most involved in the resident's care was identified for 1696 residents, and staff members returned questionnaires for 1384 residents, corresponding to an 81.6% response rate. Fig. 1 shows the numbers of distributed and returned questionnaires regarding the resident in more detail. Table 1 shows resident and nursing home characteristics per country.

The proportion of residents who staff reported were restrained in the last week of life amounted to 18% in Italy, 12% in Belgium, 4% in both Finland and Poland, 1% in England, and 0% in the Netherlands (Table 2). In the countries that reported restraint use, the share of residents who were restrained *daily* ranged from 12% in Italy to 0.4% in Poland. The overall proportion of restrained residents was significantly higher in Belgium and Italy than in the England, Finland and the Netherlands, according to 95% confidence intervals (CIs). At least one resident was restrained in their last week of life in 19/46 (41.3%) nursing homes in Belgium, 1/49 (2.0%) in England, 11/91 (12.1%) in Finland, 13/36 (36.1%) in Italy, and 10/50 (20.0%) in Poland (not in table).

With the effect of country accounted for, the probability of restraint use in residents' last week of life (daily or less frequent) increased with lower age (OR [95% CI] 0.96 [0.93 to 0.99]; $p = 0.017$; Table 3). It was not significantly associated with any other resident or nursing home characteristics.

4. Discussion

4.1. Summary of findings

Despite widespread agreement, also among government agencies, that they represent poor care and should be avoided, (Agentschap Zorg and Gezondheid, 2017; Flaherty, 2004; Kenniscentrum voor langudrende zorg, 2016) physical restraints, specifically limb or trunk restraints, were used on a concerning proportion of nursing home residents in their last week of life. Staff in Italy and Belgium reported significantly higher restraint use than staff in England, Finland and Poland. No restraint use was reported in the Netherlands. Although a greater proportion of nursing home residents were restrained in Italy than in Belgium, the practice was reported in a greater proportion of nursing homes in Belgium than in Italy, suggesting a more wide-spread use.

Table 1
Characteristics of deceased nursing home residents and nursing homes in which they resided in six European countries.

Resident characteristics	BE N = 291		ENG N = 91		FI N = 269		IT N = 200		NL N = 222		PL N = 311		P-value[a]
Age at time of death, median (IQR)	88	(83–92)	89	(85–94)	86	(82–91)	87	(81–91)	87	(83–92)	83	(74–89)	<0.001
Gender, female n (%)	174	(64)	66	(75)	169	(64)	136	(68)	138	(67)	195	(64)	0.38
Resident had dementia n (%)	183	(63)	53	(60)	222	(83)	154	(77)	135	(61)	207	(68)	<0.001
Functional status one month before death (BANS-S) [b], median (IQR)	19	(15–22)	20	(17–23)	22	(19–25)	18	(14–21)	23	(20–25)	18	(14–21)	<0.001
Nursing home characteristics													
Staffing level (FTE) of nurses relative to number of occupied beds, median (IQR)	0.15	(0.14–0.17)	0.11	(0.00–0.16)	0.61	(0.55–0.70)	0.2	(0.13–0.22)	0.09	(0.06–0.18)	0.13	(0.09–0.29)	<0.001
Staffing level (FTE) of care assistants relative to number of occupied beds, median (IQR)	0.24	(0.20–0.27)	0.69	(0.62–0.83)	0.07	(0.03–0.14)	0.36	(0.28–0.50)	0.42	(0.33–0.48)	0.16	(0.07–0.23)	<0.001
Number of residents requiring full assistance in eating, relative to care staff FTE, median (IQR)	0.43	(0.28–0.60)	0.22	(0.15–0.56)	0.48	(0.28–0.84)	0.83	(0.54–0.90)	0.28	(0.24–0.56)	1.13	(0.67–1.75)	<0.001

[a] Differences between countries tested using generalized linear mixed models with country as fixed factor and random intercept for variable nursing home. No random factors were included in tests of differences in nursing home characteristics as data clustering is on the level of nursing homes.
[b] A higher BANS-S score represents lower functional status (i.e. more problems).
Abbreviations: BANS, Bedford Alzheimer Nursing Severity-Scale; IQR: Inter-quartile range; FTE: full-time equivalent.
Missing data: Age: $n = 55$ (4%); gender: $n = 49$ (3.5%); resident had dementia: $n = 11$ (0.8%); functional status: $n = 32$ (2.3%); staffing level (FTE) of care assistants: $n = 114$ (8.2%); staffing level (FTE) of nurses: $n = 89$ (6.4%); number of residents requiring full assistance in eating: $n = 156$ (11.3%).
Percentages are rounded.

Table 2
Residents restrained through trunk or limb restraints in the last week of life according to staff member most involved in care.

Restraint use	BE N = 291	% (95% CI)	ENG N = 91	% (95% CI)	FI N = 269	% (95% CI)	IT N = 200	% (95% CI)	NL N = 222	% (95% CI)	PL N = 311	% (95% CI)
Limb and/or trunk restraints used	34	12.1 (8.4 to 15.8)	1	1.2 (0 to 3.4)	11	4.3 (1.9 to 6.7)	33	17.6 (12.3 to 22.9)	0	n/a	11	3.9 (1.7 to 6.1)
Used daily	23	8.2 (5.0 to 11.4)	1	1.2 (0 to 3.4)	10	3.9 (1.6 to 6.2)	22	11.7 (7.2 to 16.2)	0	n/a	1	0.4 (0 to 1.1)
Used less frequently than daily	11	3.9 (1.7 to 6.1)	0	n/a	1	0.4 (−0.4 to 1.2)	11	5.9 (2.6 to 9.2)	0	n/a	10	3.5 (1.5 to 5.5)
Limb and/or trunk restraints not used	245	87.8 (84.0 to 91.6)	82	98.8 (96.6 to 100.0)	246	95.7 (93.3 to 98.1)	155	82.4 (77.1 to 87.7)	200	100.0	271	96.1 (93.9 to 98.3)

Abbreviations: BE, Belgium; FI, Finland; IT, Italy; NL, Netherlands; PL, Poland; ENG, England; CI, confidence interval; n/a, not applicable.
Missing data for restraint use: BE: 4.1%; FI: 4.5%; IT: 6.0%; NL: 9.9%; PL: 9.3%; ENG: 8.8%.
Percentages are rounded.

4.2. Possible role of national legal and policy frameworks

The finding that restraints are not or rarely used in certain countries indicates that standard nursing home care does not imply their use. Our data further suggest that national policies or guidelines that highlight alternative practices, as is done in the Netherlands and England, may have an influence towards reducing restraints in nursing home care (Kenniscentrum voor langudrende zorg, 2016; Local Government and Care Partnership Directorate, 2014). Research has shown that presenting alternative practices is a core component of effective interventions to limit use of physical restraints (Gulpers et al., 2013; Möhler et al., 2012). The guidelines published in the Netherlands and England may have contributed to the low prevalence of restraint use there and could serve as examples for countries that do not have such documents.

All countries studied may benefit from clearer restraint prevention guidelines specifically for the nursing home setting. Currently, even within single countries or regions, multiple legal frameworks regulate restrictive interventions in care (e.g. laws on psychiatric care or patient rights). The relationships between these frameworks can be very complex and add to uncertainty as to how to follow them in practice (Furniaux, 2018). Furthermore, it is often not clear which laws or policies apply to nursing home residents, as they are outside the realm of psychiatric hospitals, to which most laws on restraints are adapted (Furniaux, 2018; Van den Storme and Revier, 2017). Clear restraint prevention guidelines for nursing home practice that supplement and elaborate existing laws may help staff in better judging their necessity and identifying alternative practices.

4.3. Factors associated with use of physical restraints in the last week of life

We did not find statistically significant associations between restraint use in the last week of life and resident and nursing home characteristics, except for resident's age. Age was inversely associated with higher risk of being restrained, which is contrary to findings from other studies in which restrained residents were older than unrestrained residents (Hofmann and Hahn, 2014). However, previous studies did not focus on the end of life, which makes

Table 3
Association between restraint use in the last week of life and country and resident and nursing home characteristics ($N = 1059$)[a].

Country, resident- and nursing home characteristics	Limb and/or trunk restraints used daily or less frequently than daily versus not used	
Fixed effects	p-value	odds ratio (95% CI)[b]
Country	0.020	
BE (reference)	Reference	Reference
ENG	n/a[c]	n/a[c]
FI	0.301	0.39 (0.06 to 2.35)
IT	0.218	2.00 (0.66 to 6.01)
NL	n/a[c]	n/a[c]
PL	0.001	0.17 (0.06 to 0.50)
Resident characteristics		
Age	0.017	0.96 (0.93 to 0.99)
Female gender	0.243	0.71 (0.40 to 1.26)
Resident had dementia	0.923	1.03 (0.52 to 2.06)
Functional status (BANS total score)[d]	0.082	1.06 (0.99 to 1.13)
Nursing home characteristics		
Staffing level (FTE) nurses relative to no. of occupied beds	0.420	0.27 (0.01 to 6.51)
Staffing level (FTE) care assistants relative to no. of occupied beds	0.457	0.28 (0.01 to 8.27)
No. of residents within nursing home requiring full assistance in eating relative to staffing level (FTE)	0.452	0.98 (0.91 to 1.04)
Random effects	p-value	Estimate (95% CI)
Nursing home	0.004	1.22 (0.62 to 2.40)

Abbreviations: BE, Belgium; FI, Finland; IT, Italy; NL, Netherlands; PL, Poland; ENG, England; BANS, Bedford Alzheimer Nursing Severity-Scale; CI, confidence interval; n/a, not applicable; FTE, full-time equivalent.

[a] Generalized linear mixed model; $N = 321$ (23.2%) cases were excluded due to missing data on one or several independent variables; dependent variable: restraints used daily or less frequently than daily versus not used; fixed factors: country, age, gender, presence of dementia, nurses staffing level relative to no. of occupied beds, care assistants staffing level relative to no. of occupied beds, residents per nursing home needing full-time assistance in eating relative to staffing level of nurses and care assistants; random intercept for nursing home.

[b] Exponentiated beta coefficient.

[c] Too few cases of restraint use; association could not be calculated.

[d] A higher BANS-S score represents lower functional status (i.e. more problems).

these findings difficult to compare. The association we found with age was small, and the statistical significance may also be related to the large sample size. We also found an inconsistency with existing literature in the association between physical restraining and functional status (Hofmann and Hahn, 2014). This could be an effect of the measure we used, as the Bedford Alzheimer Nursing Severity-Scale (BANS-S) is meant to measure functional status in people with advanced dementia. We used this measure as the vast majority of nursing home residents have dementia at the end of their life. It focuses less on mobility than other measures of functional status or activities of daily living, but includes items on - amongst others – sleeping, speech, joint motion and eye contact. It is possible that these constructs are not associated with restraint use at the end of life.

The lack of a statistically significant association between nursing home characteristics and restraint use at the end of life echoes the conclusions of studies conducted over last two decades that organizational characteristics are not the most important predictors of physical restraint use (Flaherty, 2004). Low staffing levels relative to the number of residents have often been postulated as risk factors (Agentschap Zorg and Gezondheid, 2017; Flaherty, 2004). However, numerous studies – including this study of the end of life – show no significant association between the resident to nurse ratio and restraint-free care (Flaherty, 2004; Heeren et al., 2014). Qualitative research indicates that a better understanding of the drivers of physical restraint use may be gained by studying staff knowledge of and attitudes towards physical restraints, staff members' role in the organizational context (e.g. involvement in decision-making to remove restraints), as well as strategies for the transition from acceptance of restraints as examples of poor care to their effective removal (Heeren et al., 2014; Kong et al., 2017). Although a Cochrane review from a few years ago concluded that there is insufficient evidence supporting the effectiveness of educational interventions for preventing or reducing the use of physical restraints in geriatric long-term care (Scheepmans et al., 2018), more recent clinical trials showed that multi-component educational interventions that target nursing home staff alongside organizational factors (Gulpers et al., 2012; Muñiz et al., 2016), can significantly reduce physical restraint use with effects persisting in the longer term (Gulpers et al., 2013), and without increases in falls, fall-related injuries or psychotropic medication use. The components that these interventions had in common are the introduction of an institutional policy or guideline that discourages restraints, staff education, provision of alternative measures, and consultation by a clinical expert (e.g. nurse specialist) experienced in restraint prevention, or assignment of a 'champion' or 'restraint prevention coordinator' within the nursing home. Future research should include in-depth case studies of carefully selected comparator nursing homes with high and low use of physical restraints to further understand the drivers of this practice as well as successful prevention measures.

4.4. Strengths and limitations

To the best of our knowledge, this is the first epidemiological study of restraint use among nursing home residents who are at the end of life. The main strengths of this study lie in the population-based nature of the data, the standardized data collection across multiple countries, and in the investigation of restraint use during a clearly delineated period in the care trajectory, i.e. the last week of life. Although we ensured nationwide representative samples of nursing homes in terms of region and size, a potential limitation of this study is participation bias on the part of nursing homes. Managers with a particular interest in research or pal-

liative and end-of-life care may have been more likely to agree to participate in the study than those without such interest. A further limitation is that we do not have systematic records of reasons for non-participation by nursing homes. We are also not aware of the reasons why some staff did not return questionnaires. We studied limb and trunk restraints, which are among the most restrictive types of restraints, but not other types of restraints, such as bed rails, nor the reasons why individual residents were restrained. This study is a first general screening of the use of physical restraints in dying nursing home residents in different countries and should prompt further in-depth research on the occurrence of different types of restraints and reasons for their use. A further potential limitation is recall bias by respondents and the possibility that staff underreported restraint use by responding in a socially desirable manner or by not responding to the respective question. Restraint use may also have been underreported for residents who died outside of the nursing home. The risk of underreporting means that our findings represent a minimum estimate of limb and/or trunk restraint use in these countries. Furthermore, we do not have data regarding the administration of psychotropic medication with the aim to restrain residents, as restraint use was not the primary research topic of the study that collected these data.

5. Conclusions

In all but one of the six countries studied, nursing home staff reported that varying proportions of nursing home residents were restrained through limb and/or trunk restraints in the last week of life. The proportion of restrained residents was higher in Italy and Belgium, compared to Poland, Finland, England, and the Netherlands. Lack of or lower restraint use in several of the countries studied suggests that its reduction or elimination is a realistic and achievable aim. These data highlight a pressing need for national strategies aimed at preventing this practice. Clear guidelines for nursing home practice, alongside relevant legal frameworks, that explicitly discourage the use of physical restraints and suggest alternatives may be an effective component of such strategies.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data statement

The data can be obtained from the authors (LP, TS or LVdB) upon reasonable request. Data will be shared with members of universities, scientific research institutions, or clearly separate and independent research departments of public institutions or non-profit organisations. Data may be used for scientific research only (commercial use of data will not be permitted).

Ethical approval

The research teams in Belgium, Finland, Poland and England obtained ethical approval from their respective ethics committees: Ethics Committee of Brussels University Hospital (143201422845); Committee for Research Ethics of the Ministry for Health and Wellbeing (THL/116/6.02.01/2015); Ethics Committee of Jagiellonian University (122.6120.11.2015); NHS Health Research Authority (15/NW/0205). The research teams in the Netherlands (Medical Ethics Commission of VU University (2014.587) and Italy (Ethics Committee of Università Cattolica del Sacro Cuore; no identification number) obtained waivers for the collection of data of deceased residents. The return of a self-report questionnaire was taken as consent to participate.

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CRediT authorship contribution statement

Lara Pivodic: Conceptualization, Formal analysis, Methodology, Writing - original draft, Writing - review & editing. **Tinne Smets:** Data curation, Methodology, Conceptualization, Writing - review & editing. **Giovanni Gambassi:** Data curation, Methodology, Conceptualization, Writing - review & editing. **Marika Kylänen:** Data curation, Methodology, Conceptualization, Writing - review & editing. **H. Roeline Pasman:** Data curation, Methodology, Conceptualization, Writing - review & editing. **Sheila Payne:** Data curation, Methodology, Conceptualization, Writing - review & editing. **Katarzyna Szczerbińska:** Data curation, Methodology, Conceptualization, Writing - review & editing. **Luc Deliens:** Methodology, Conceptualization, Writing - review & editing. **Lieve Van den Block:** Supervision, Data curation, Methodology, Conceptualization, Writing - review & editing.

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